

Executive Summary

The 3,113 acres of undeveloped, OWM-controlled land surrounding the four Sudbury system reservoirs and their tributaries are the system's most valuable asset. The comprehensive Watershed Protection Plan for the Sudbury Reservoir watersheds described these lands surrounding the reservoir as the most significant existing protection measure for the Sudbury water supply (MWRA, 1997). This 10-year Land Management Plan for the Watersheds of the Sudbury Reservoirs sets out policies, goals, and methods for managing these lands within the primary purpose of protecting the public water supply. In addition, the plan describes active forest management, a program for tree planting on private land along key tributaries, and plans to protect wildlife, biological diversity, and cultural resources through specific management practices.

In planning the management of OWM land in the Sudbury watersheds in the context of the overall DWSP/OWM - MWRA System (Figure 1), the two basins (North and South Basins - Figure 2) are treated differently. The 2,323 acres of OWM land in the North Basin serve to protect the Sudbury and Foss Reservoirs, which have emergency standby status, while the 790 acres of OWM land in the South Basin serve to protect the Brackett and Stearns Reservoirs as well as Cedar Swamp and the Sudbury River, none of which have any status as water supply for the OWM/MWRA system (and have not been used since the early part of the last century). The bulk of active land management will be focused on the North Basin.

The primary goal of OWM's land management plans is to provide the best possible vegetative cover throughout the watersheds for protecting tributary and reservoir water quality. The most important objective for this plan is to maintain the functioning of this watershed protection forest, in both the short and long terms, by first correcting deficiencies in pine plantations and understory development, and then working steadily to produce a vigorous, diverse, stable, multi-layered forest cover. In the process of reaching the above objectives, OWM managers will simultaneously address the protection of wildlife, biological diversity, and cultural resources. In addition, staff will maintain OWM property boundaries, identify and work to quickly resolve boundary encroachments, enforce public access guidelines, protect against fires, and maintain access roads.

The **introductory section** of this plan presents the legislative **mandates**, agency mission statements, and other foundations for DWSP's land management program, as well as a general overview of the plan. The former MDC Division of Watershed Management's mission was laid out in its enabling legislation and subsequent amendments, found in MGL Ch. 92, Sections 104-120 (repealed by 2003, 26, Sec. 289. Also see 2003, 26, Sec. 715). The statute directed the DWM to "*...construct, maintain and operate a system of watersheds, reservoirs, water rights and rights in sources of water supply, ...supply thereby a sufficient supply of pure water to the Massachusetts Water Resources Authority, and ...utilize and conserve said water and other natural resources in order to protect, preserve and enhance the environment of the commonwealth and to assure the availability of pure water for future generations ...*" These legislative mandates persist despite a recent reorganization that merged the former Department of Environmental Management and the former Metropolitan District Commission to form the new Department of Conservation and Recreation, which includes the Division of Water Supply Protection and the Office of Watershed Management (OWM). OWM land management on the properties surrounding the Sudbury Reservoirs recently received "green" certification by the international Forest Stewardship Council as part of a successful Commonwealth forest certification effort by the Executive Office of Environmental Affairs.

Section 2 of the plan, a **description of Sudbury Reservoir Watershed Resources**, provides an overview of the natural and cultural resources contained in the Sudbury system lands. The OWM controls 3,113 acres of land and 1,830 acres of water, or approximately 10% of the 47,840 acres of land and water in the watersheds of the entire Sudbury system. In the Sudbury Reservoir and Foss

Reservoir watersheds (North Basin), OWM controls approximately 22% (land and water) and an additional 7% is protected by other state, municipal, or non-profit conservation ownership or by private land under Chapter 61, the Massachusetts Forest Tax Law. In the Brackett Reservoir and Stearns Reservoir watersheds (South Basin), OWM controls approximately 4% (land and water), and an additional 16% is protected by other owners or programs. In the North Basin, OWM and MWRA control 74% of the land within 400 feet of the reservoir and the open channel. In the North Basin, OWM controls approximately 32% of the land within 400 feet of the reservoir and its tributaries and additional land in this buffer is in protected open space. Overall, forests cover 38% of the North Basin and 51% of the South Basin.

Soils on OWM Sudbury land are grouped into five types with approximately 11% excessively well-drained, 5% well-drained thin, 31% well-drained thick, 9% moderately well-drained and 44% poorly drained. Elevations range from 252 feet on the Sudbury Reservoir surface (when full) to 464 feet at Pine Hill, and 97% of the land in the system is less than 20% slope while just 0.5% exceeds 30% slope.

The South Basin is dominated by the Sudbury River. The North Basin includes two major tributaries (Crane and Marlborough Brooks) and many small streams. Average annual precipitation on the watersheds is 44 inches, and average precipitation yield to the reservoirs is 50%.

The majority of the present forest overstory on OWM-controlled Sudbury land is 60 to more than 100 years old, originating from farm abandonment and plantation establishment beginning in the late 1800s, as well as an unknown acreage that was reinitiated by the hurricane of 1938. Forest types are approximately 60% softwood and 40% hardwood in the managed forest (approximately 1,200 acres) with 45% in white pine types, 24% in red maple and mixed hardwood types and 17% in oak types. Approximately 410 acres (35% of the managed forest) have been silviculturally treated over the past 10 years.

Wildlife on the Sudbury system lands is abundant and varied, and includes at least five species on the rare and endangered and "special concern" list of the Natural Heritage and Endangered Species Program.

Cultural resources on the Sudbury system lands include both historic and prehistoric sites. The Cedar Swamp is listed on the National Register of Historic Places as an Archaeological District with thirty-two pre-historic sites documented, three of which are on OWM lands. The Sudbury watershed is one of the most historically significant components in the OWM/MWRA system and dates to 1873 when construction began. Eight historic districts, comprising 77 buildings and structures on eleven individual OWM properties are listed in the National Register of Historic Places.

Section 3 identifies **principles** of watershed management that drive management goals and objectives for the Sudbury watershed lands. These principles were distilled from an extensive literature review and principles are identified in the areas of Watershed Protection, Water Yields, Watershed Forest Management, Air Pollution Impacts, and Wildlife Impacts.

Section 4 identifies **OWM goals** for managing the Sudbury lands during the ten years from 2004 through 2013. Goals are identified for overall Watershed Management, Water Quality and Yields, Land Protection, Forest Management, Wildlife Management, and Cultural Resource Protection. Goals identified are as follows:

- Provide the best possible land cover for protecting reservoir water quality.
- Minimize or mitigate both point and non-point sources of water pollution.
- Minimize the long-term cumulative export of phosphorus, nitrogen, and turbidity to the reservoirs.
- Provide a safe supply of water, under emergency conditions, for present and future generations.

- Limit land uses on the OWM lands to those that do not threaten water quality.
- Provide control over non-forest land use on OWM lands (e.g., roads), the effects of natural events (e.g., fire), and human activities that threaten water or other natural resources.
- Limit the disposition of OWM land for municipal or private use, through adherence to the OWM Land Disposition Policy.
- Provide a vigorous forest cover, diverse in species composition and tree sizes and ages, across the vast majority of OWM lands.
- Maintain forest cover that balances active growth and nutrient assimilation, dense filtration, temperature regulation, and active reproduction.
- Retain this forest cover by encouraging and maintaining adequate forest regeneration across OWM lands.
- Enhance and maintain the ability of the watershed forest to both resist and recover from disturbance.
- Prevent erosion of sediments and nutrients from the watershed forest, and provide for active assimilation of available nutrients.
- Limit the effects of human-caused air pollution by providing vegetative cover that filters and/or buffers pollutants.
- Develop a low-maintenance watershed forest that provides long-term water quality protection with minimal intervention.
- Conduct any forest management activity such that the resulting benefits outweigh any potential negative impacts; comply with or exceed all environmental regulations governing forest management activities in Massachusetts.
- Salvage dead and downed material in areas where this salvage will reduce the threats of fire or nutrient transport, and limit the need for salvage, through deliberate management practices aimed at reducing the likelihood of damage.
- Mitigate adverse impacts of wildlife on infrastructure and other watershed resources.
- Protect uncommon, rare, and otherwise significant wildlife species and habitats wherever they exist on OWM lands.
- Assess and mitigate impacts of watershed management activities on wildlife through a process of notification, site visits, review of records and literature, and recommendations to appropriate staff.
- Maintain an undeveloped, forested condition on most of the OWM's land holdings.
- Work to identify all uncommon or rare species present on OWM lands, and provide habitat conditions and levels of protection recommended for perpetuating these species.
- Where feasible and applicable, and on limited acreage, maintain early successional forested and non-forested habitats on OWM lands.
- Work to identify and eliminate invasive species from OWM properties.
- Maintain forest reserves on a portion of the OWM's holdings.
- Identify significant cultural resources on watershed lands.
- Prevent degradation of cultural sites and resources.

Section 5 describes the **objectives and methods** proposed in the plan for meeting the stated goals for **Land Protection, Forest Management, Management of Biodiversity, Wildlife Management**, and the **Protection of Cultural Resources**.

Land Protection:

OWM has not had an active land acquisition program at Sudbury watershed due to the higher priority of programs at the three active water supply watersheds and the lack of bond monies earmarked for Sudbury. Due to the emergency-only status for the Sudbury system, this is not likely to change. Some properties may be disposed of or reassigned to other state agencies, according to an established land disposition policy.

The condition of the riparian areas along the reservoirs and their tributaries has been identified as a priority concern for Sudbury land management. A pilot program to reestablish forest and shrub cover within deforested riparian zones was successfully implemented during the past decade and will be expanded, as funding allows, during the coming decade.

OWM staff works to maintain agency property boundaries within the Sudbury watersheds and to rapidly resolve any encroachments encountered. Watershed Rangers provide infrequent patrols for violations of access regulations and works with local police to enhance this surveillance and reduce the impacts of inappropriate or illegal activities on Sudbury natural resources.

Fire protection for OWM properties is primarily the responsibility of the local municipal fire departments. The plan identifies the need to maintain access roads and train and equip OWM staff in order to improve response to fires that do occur.

There are approximately 10 miles of OWM-maintained access roads within the Sudbury system, 3.7 of which have been identified for upgrading during the period covered by this plan. Best Management Practices are identified for access road work, as well as an internal review process for proposed new roads or gravel operations to maintain existing access roads. Guidelines are described for determining when beaver impact control is required, as well as methods for reducing these impacts.

Approximately 1,026 acres of OWM Sudbury lands have been classified as Areas with Special Management Restrictions. These areas include large blocks of land such as the Cedar Swamp and Crane Swamps. Overall, they include 116 acres of islands in the Sudbury Reservoir, 505 acres of wetlands, and 405 acres of riparian zones. In addition, many small areas have been included, representing sensitive resources and buffers around historic and rare wildlife habitats.

Forest Management:

There are two major objectives for forest management activities on the Sudbury watersheds during the next 10 years; 1) to foster tree regeneration where it is lacking and 2) to replace plantations with a mix of native species better suited to these sites. Management activities recommended in this plan attempt to mitigate the effects of natural disturbances. While the frequency of occurrence of catastrophic winds or major insects or diseases in New England cannot be changed, the resistance and resilience of a forest to such impacts can be enhanced. Silviculture is proposed to accomplish these objectives and to move the forest generally toward a stable, multi-layered, diverse, and vigorous condition across the watersheds. This will include, for the ten year period of the plan, 300 acres of plantation thinnings and regeneration cuts, 10 acres of intermediate thinnings in non-plantation stands, and 100 acres of preparatory and regeneration cuts in non-plantation stands. Regeneration cuts will generally produce openings ranging from ¼ to 2 acres in size, averaging about 1 acre. For unstable plantations, openings may range to 5 acres in size in order to more quickly replace these with more stable mixed natural forests. Finally, up to 3,000 seedlings will be planted on 30 acres during this coming decade, to enhance regeneration as needed.

Silviculture is described in the plan by forest type, and a carefully designed set of conservation management practices is outlined that will guide all forest management activities and limit short-term negative effects. The details of the timber harvest permit used to control harvesting and the internal review process for all proposed timber sales are reviewed. Specific policies are explained regarding the management of lands in the South Basin, where less active management is necessary due to the off-line nature of these reservoirs

Management of Biodiversity:

The OWM recognizes that its greatest contribution to regional and local biodiversity is protecting significant areas of land from development and maintaining those lands in forest or other natural cover. The Sudbury watershed system is an exceptionally difficult place to address the challenges of conserving biodiversity. The watersheds are densely populated, fragmented, subjected to invasive species, and under intense development pressure. Remaining natural areas tend to be relatively small and isolated. Nonetheless, there are opportunities within these properties to pay attention to and enhance biological diversity. The plan reviews the sources of the mandate to protect biodiversity and then describes what is currently known about the diversity of Sudbury flora and fauna and natural communities, including Cedar Swamp. The problem of invasive plants is pronounced in the Sudbury system, due to the frequency of landscape disturbances, but with adequate staff and funding, control measures can be applied to at least protect against the loss of rare species or habitats to invasive species. Finally, this section reviews the importance of early successional habitats, both wooded and non-wooded, in supporting biodiversity. OWM intends to maintain its 227 acres of open grasslands in the Sudbury system to support Neotropical migratory birds, raptors, and butterflies, among other species, as well as to regularly produce small areas of early-successional woody habitats.

Wildlife Management:

Land management activities that alter vegetation and other habitat conditions have corresponding impacts on the wildlife community in that area. Some of the likely impacts associated with the habitat changes that will result from the implementation of this plan are discussed. Changes in wildlife habitat conditions at Sudbury will result from the planned forest management activities. The net result will be increased structural diversity of the forest cover on much of the OWM holdings. These changes will occur gradually over the next several decades, but should begin to be evident during this ten year management period. Overall wildlife diversity on the reservation will likely increase, as species that utilize lower and middle strata of forest cover will increase. Decreases in those species that prefer closed-canopy, open-understory conditions will also likely occur. The larger openings created when weakened pine plantations are removed, will favor species that utilize early-successional habitats.

The forest management program described in this plan can result in substantial changes in wildlife habitat. The plan recommends specific actions to minimize the negative impacts and maximize the benefits of OWM's silvicultural operations for wildlife. These actions include: observing buffer zones around rare species habitats, using a low intensity of management whereby each site is treated on an average of every 25-30 years, conducting operations in certain areas only in winter and observing certain guidelines in the selection of trees to be removed and left (especially leaving large snags and important cavity and mast trees). The importance of abundant levels of dead and downed material is highlighted as well as providing protection for vernal pools and wintering areas. Specific recommendations for maintaining each of these habitat features are outlined in the plan.

Some wildlife species require direct management to prevent negative impacts on water quality, forest conditions, or infrastructure. The plan outlines situations in the Sudbury system that require direct wildlife management, including flooding of access roads by beaver and disruption of dam integrity by

burrowing animals. OWM will follow specific procedures outlined in the plan to address these situations on the Sudbury watersheds, resorting to lethal controls only when non-lethal controls are not effective.

Protection of Cultural Resources:

Without appropriate controls, land management programs can be detrimental to archaeological resources. Accordingly, the foundation of OWM's cultural resource management program is a process for reviewing proposed silvicultural operations and recommending management practices to protect important cultural resources. For those silvicultural operations planned for sites that have been classified as *highly or moderately sensitive for prehistoric resources*, restrictions are recommended on the time of year and the types of equipment and techniques used. Recommendations are also provided for protecting historic resources. Vegetation, if left to grow unchecked in and around stone foundations, and other historic structures like dams, raceways, etc., will ultimately alter these archaeological features. Accordingly, a limited and selective management program to control vegetation growth in and around archaeological sites and historic buildings and structures is recommended. Further inventory, archaeological sampling, and public education are recommended to bolster cultural resource protection in the long term.

Section 6 identifies priorities for **research, inventory, and monitoring**. While outside research takes place regularly on OWM watershed properties, this section specifically identifies research that would address current and future agency concerns. Identified needs include monitoring of forest management effects, analysis of optimum riparian vegetation, inventory and control of invasive plant species, analysis of Sudbury road conditions, and measurements to describe the age structure of the current Sudbury forests. Wildlife topics needing further research include documentation of critical habitats and rare species occurrences, and monitoring of wildlife activities, including loon nesting, breeding success of Canada geese, and general breeding bird surveys. The principal research need for the continued protection of cultural resources within OWM properties on the Sudbury Reservoir watersheds is to inventory, accurately map, and digitize all known historic cultural sites.

Section 7 of the plan outlines the strategy for regular **public involvement** in the development and implementation of the Sudbury Land Management Plan, including objectives for better understanding the public's interest in the Sudbury watershed properties, for better informing the public about the OWM intentions and obligations in managing these lands, and for involving the public in regular reviews and revisions of the plan as conditions change through time.

Section 8 provides a bibliography of **literature cited** in the plan as well as general references that are frequently used by OWM in the development of land management plans (a total of 329 references).

Section 9 provides a **glossary** of terms used in the plan.

SUMMARY

The Sudbury Land Management Plan outlined above represents a comprehensive approach to the management of the natural resources within the Sudbury watersheds. One of the main tenets of this plan is that a proactive and long-range approach is well justified, given the importance of the task at hand. This plan synthesizes a large body of research, literature, and staff expertise on a focused goal of protecting and enhancing the natural filtration capabilities of the 2,323 acres of OWM property surrounding the Sudbury and Foss Reservoirs in the North Basin of this system.